



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

EARSS in Ireland, 2006

Results of
invasive enterococcal infection (blood)
surveillance

Antibiotic codes: Enterococci

| | |
|------------|-----------------------|
| AMP | Ampicillin |
| HLG | High Level Gentamicin |
| VAN | Vancomycin |
| TEC | Teicoplanin |
| ERY | Erythromycin |
| TCY | Tetracycline |
| LNZ | Linezolid |

EARSS enterococci:

Objective and case definition

Objective:

To determine the proportions of enterococcal isolates from blood only that are resistant to ampicillin, high level gentamicin and vancomycin

Case definition:

EARSS collects data on the first invasive isolate of *E. faecalis* and *E. faecium* 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

E. faecalis

Annual proportions of AMR *E. faecalis* bacteraemia, 2002-2006, with 95% Confidence Intervals (CI)

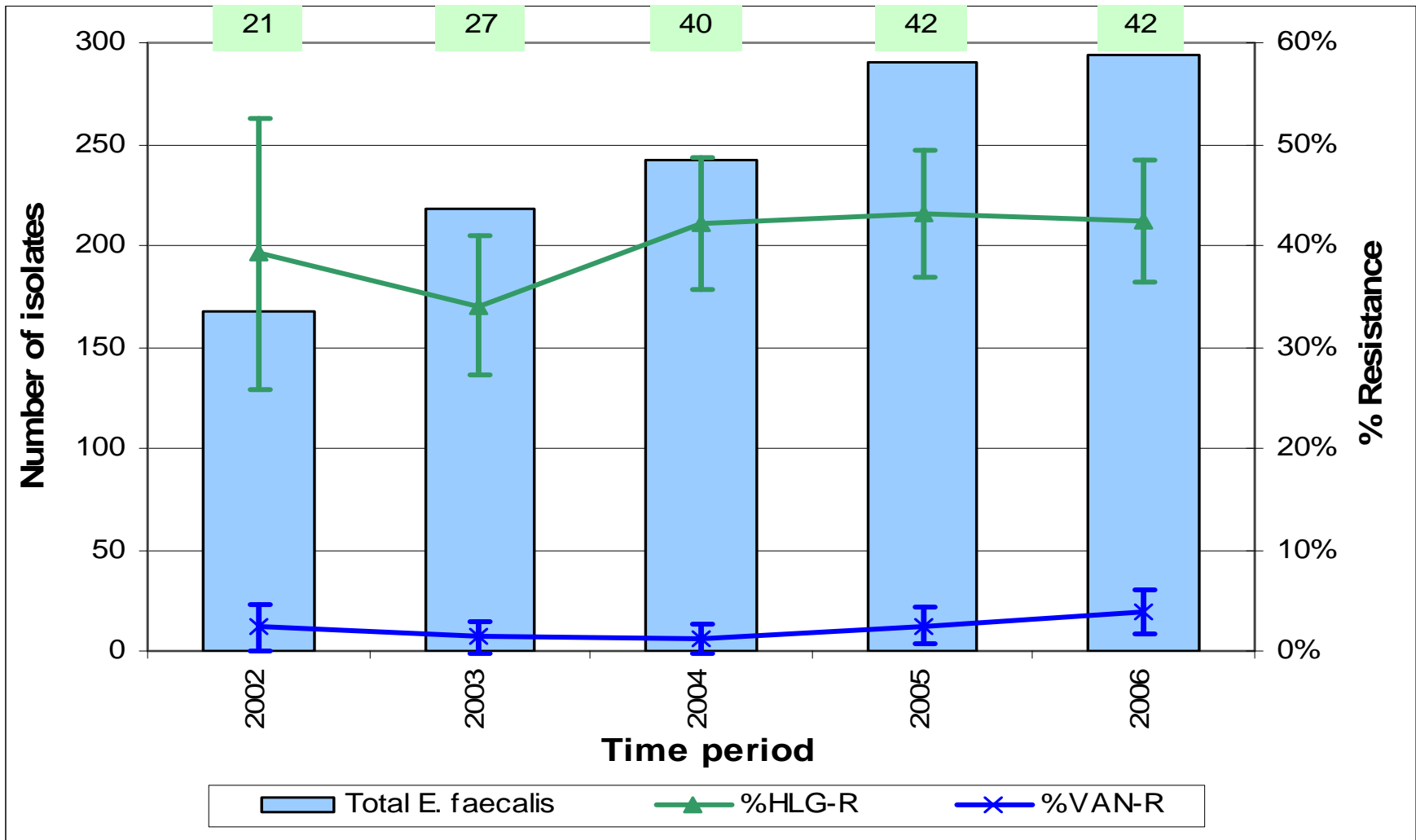
| Year | No. labs | No. isolates | %AMP-R* | 95%CI | %HLGR* | 95%CI | %VAN-R* | 95%CI |
|------|----------|-----------------|---------|-----------|--------|------------|---------|----------|
| 2002 | 21 | 168 | 8.1% | 3.9-12.4% | 39.2% | 25.8-52.6% | 2.4% | 0.1-4.7% |
| 2003 | 27 | 218 | 5.3% | 2.3-3.1% | 34.1% | 27.1-41.0% | 1.4% | 0-2.9% |
| 2004 | 40 | 242 | 0.8% | 0-2.0% | 42.2% | 35.6-48.8% | 1.3% | 0-2.7% |
| 2005 | 42 | 290 | 3.5% | 1.4-5.6% | 43.1% | 37.0-49.3% | 2.5% | 0-4.3% |
| 2006 | 42 | 294 | 4.5% | 2.1-7.0% | 42.4% | 36.3-48.4% | 3.7% | 0-5.9% |

HLGR, high-level gentamicin resistant

* Not all isolates tested

EARSS in Ireland:

E. faecalis bacteraemia trends, 1999-2006

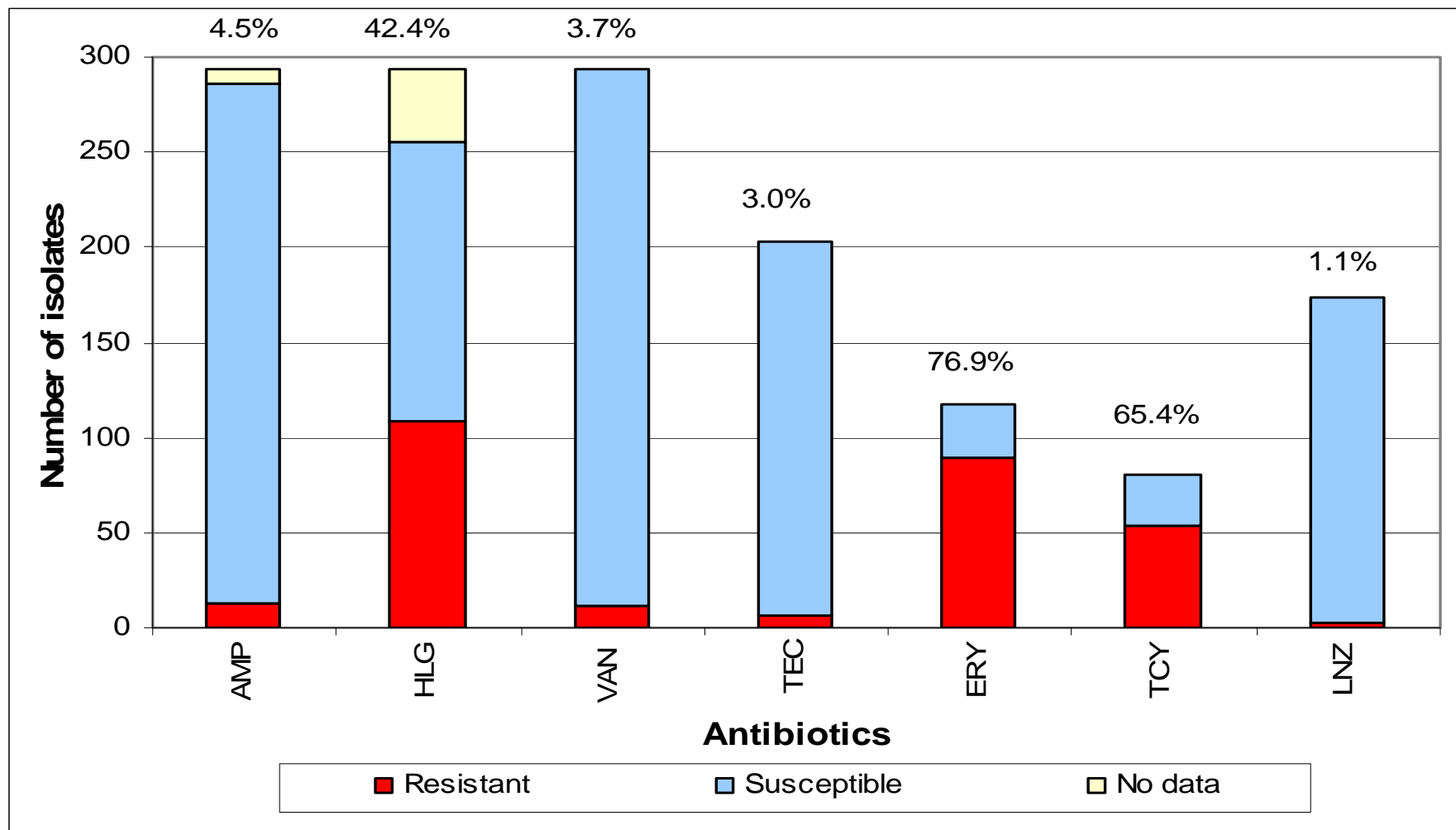


Changes in the numbers of participating laboratories are indicated above the bars

Comparison of 2006 data with 2005

- There were no obvious differences in the proportions of *E. faecalis* isolates with resistance to either HLG or VAN from 2005 to 2006
- This was confirmed by the overlapping 95% confidence intervals

Susceptibility data for *E. faecalis* bacteraemia isolates reported in Ireland in 2006



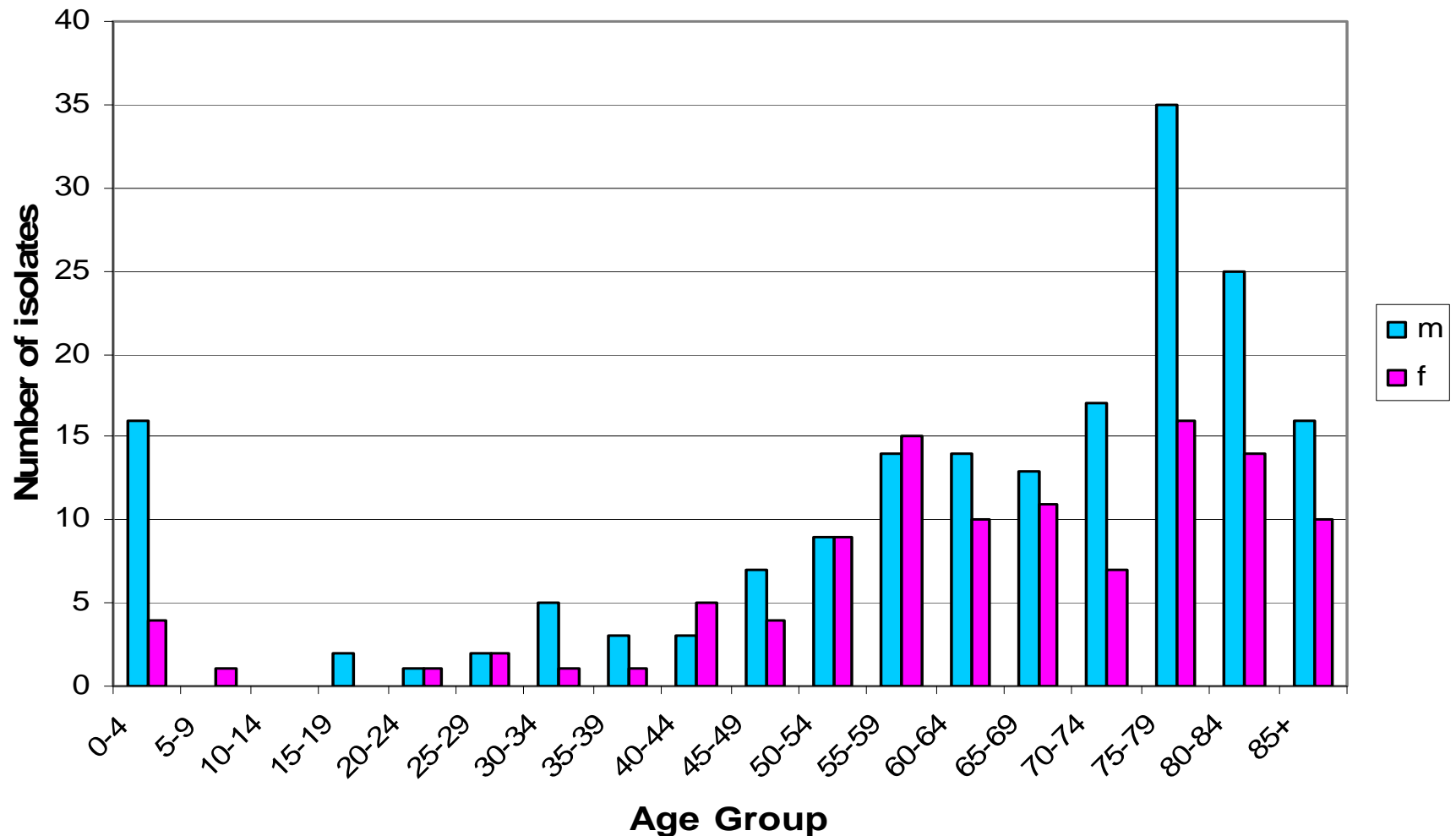
Percentage resistance is indicated above the bar

Resistance profiles of *E. faecalis* isolates in 2006 (n = 294)

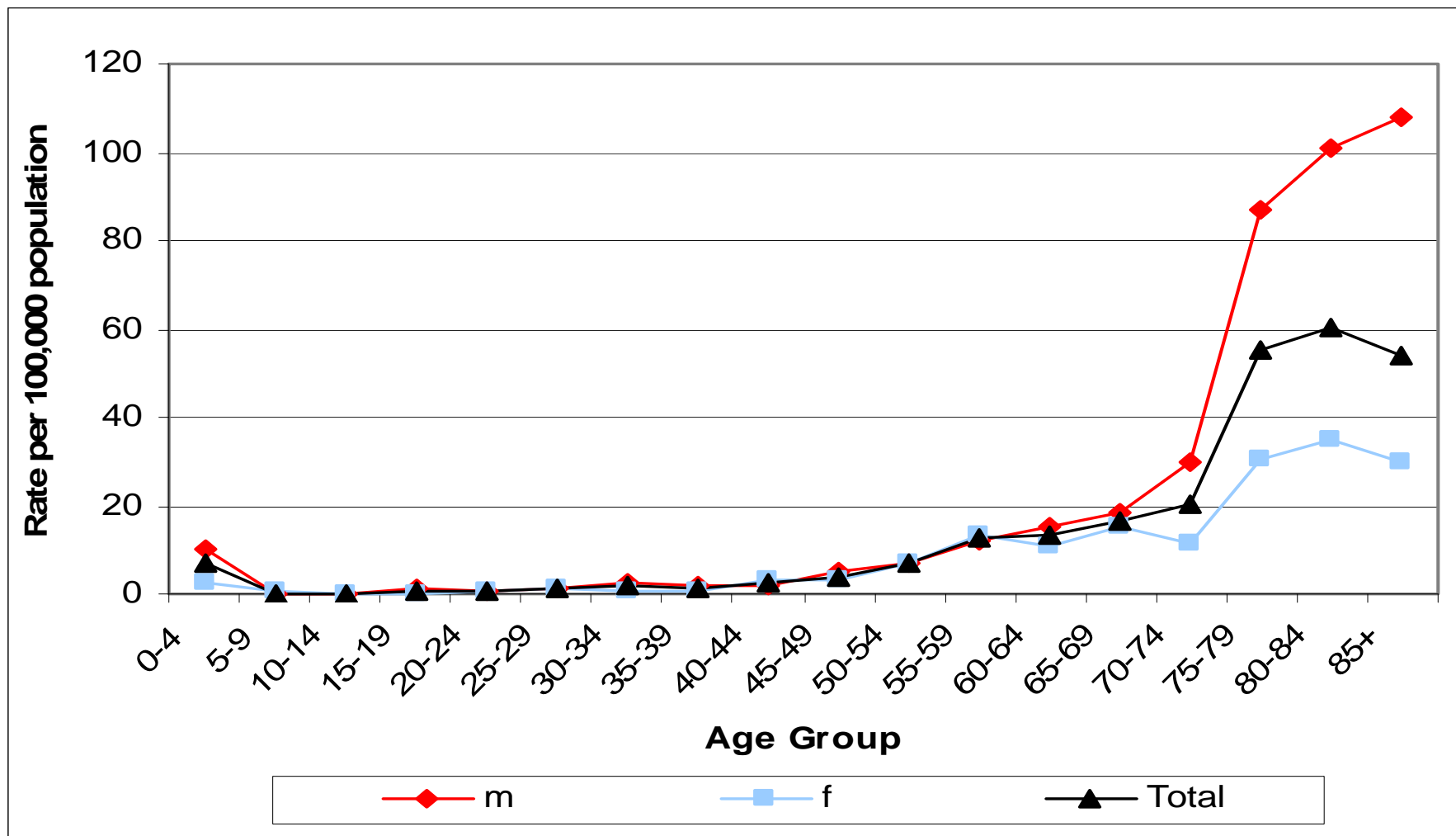
| Resistance Profile | No. isolates | |
|-------------------------------|--------------|--|
| Fully susceptible | 138 | 2x ?ID (QDA-S EFA) |
| A | 3 | 2x ?ID (AMP-R EFA); 1x ?AST/ID (AMP-R QDA-R EFA) |
| G | 97 | ?1x HLG-I |
| V | 3 | 1x ?ID (VAN-I EFA) |
| AG | 4 | ?ID (AMP-R EFA) |
| AV | 2 | ?ID (AMP-R EFA) |
| GV | 5 | |
| Not tested against all | 42 | 4x ?ID (AMP-R EFA) |
| Total | 294 | |

A, Ampicillin; G, High-Level Gentamicin; V, Vancomycin

Age and sex distribution of patients with *E. faecalis* bacteraemia in Ireland in 2006



Age and sex-specific incidence rates of *E. faecalis* bacteraemia in Ireland in 2006



Using the 2006 census as the denominator

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

Mean, median, mode and range of ages of patients with *E. faecalis* bacteraemia infection in Ireland in 2006

| | No. | No. with age | mean | median (95%CI) | mode | range |
|--------------------|-----|--------------|------|----------------|------|----------|
| <i>E. faecalis</i> | 294 | 294 | 62y | 68y (65-72y) | 78y | 0d - 97y |

Sex distribution of patients with invasive *E. faecalis* infection in Ireland in 2006

No. male = 182

No. female = 111

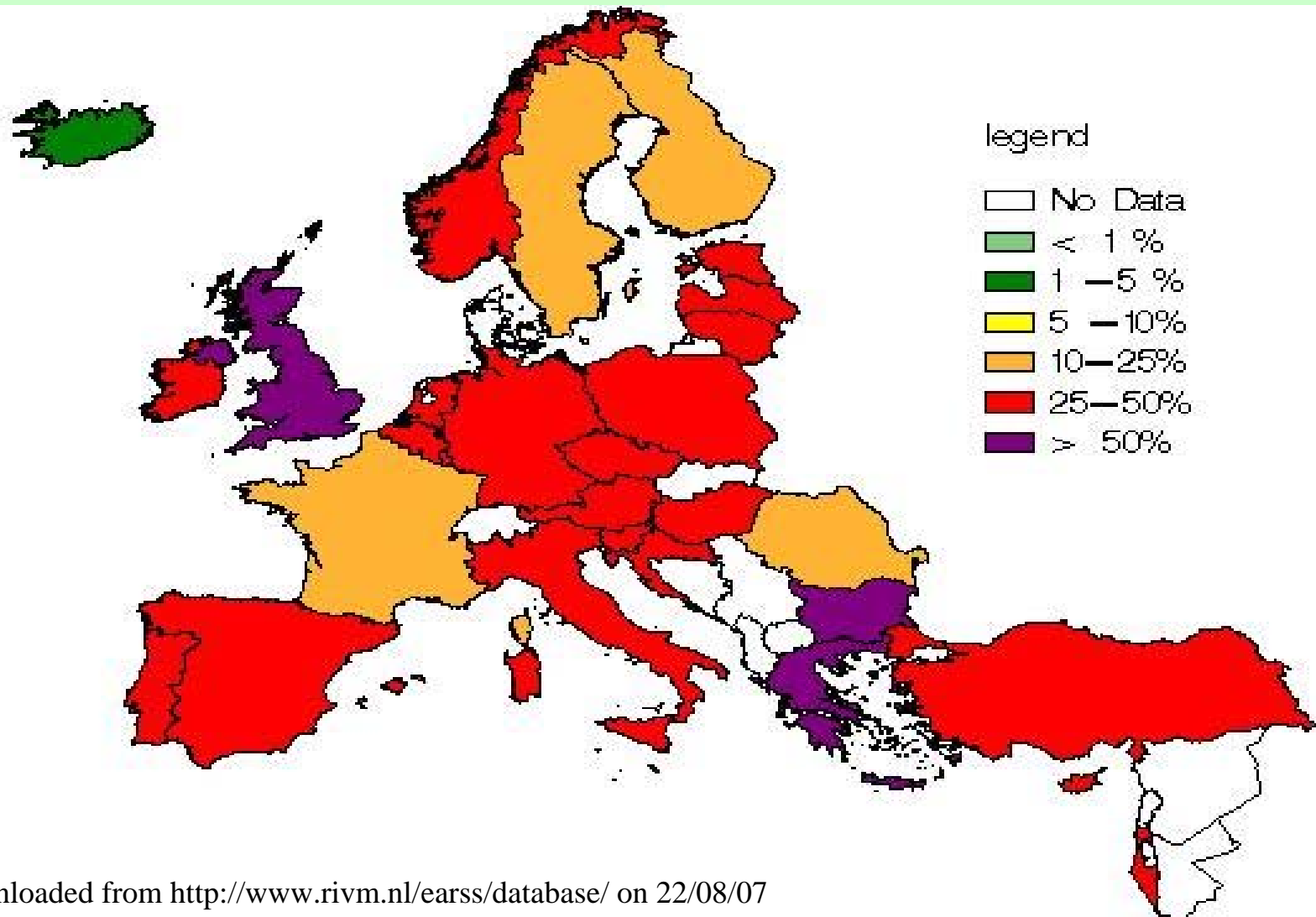
(Gender unknown = 1)

Male-to-female ratio = 1.64:1

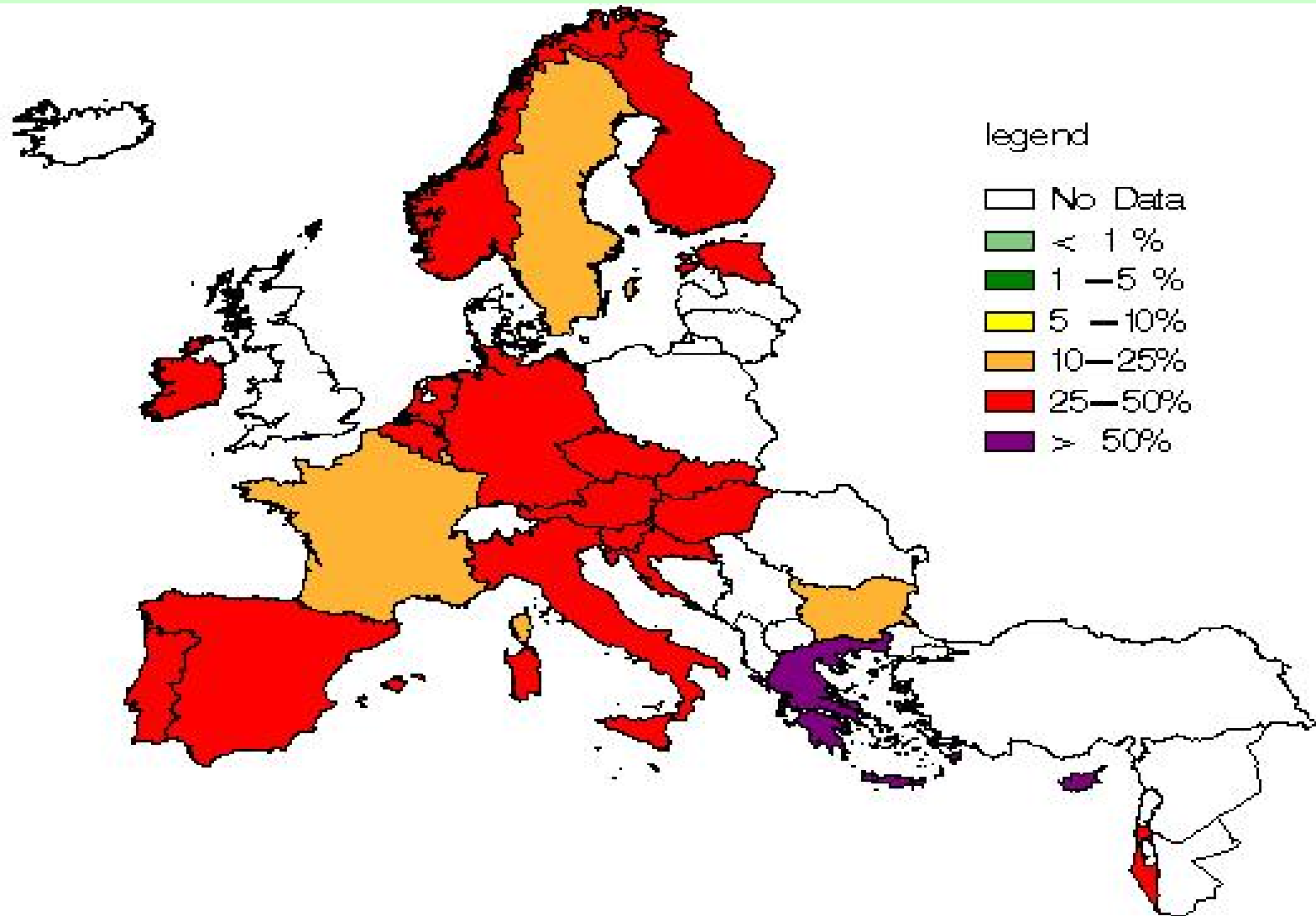
(z-test = 4.275, P-value <0.001)

Males were approximately 1.6-times more likely to get an invasive *E. faecalis* infection than females, which was significant

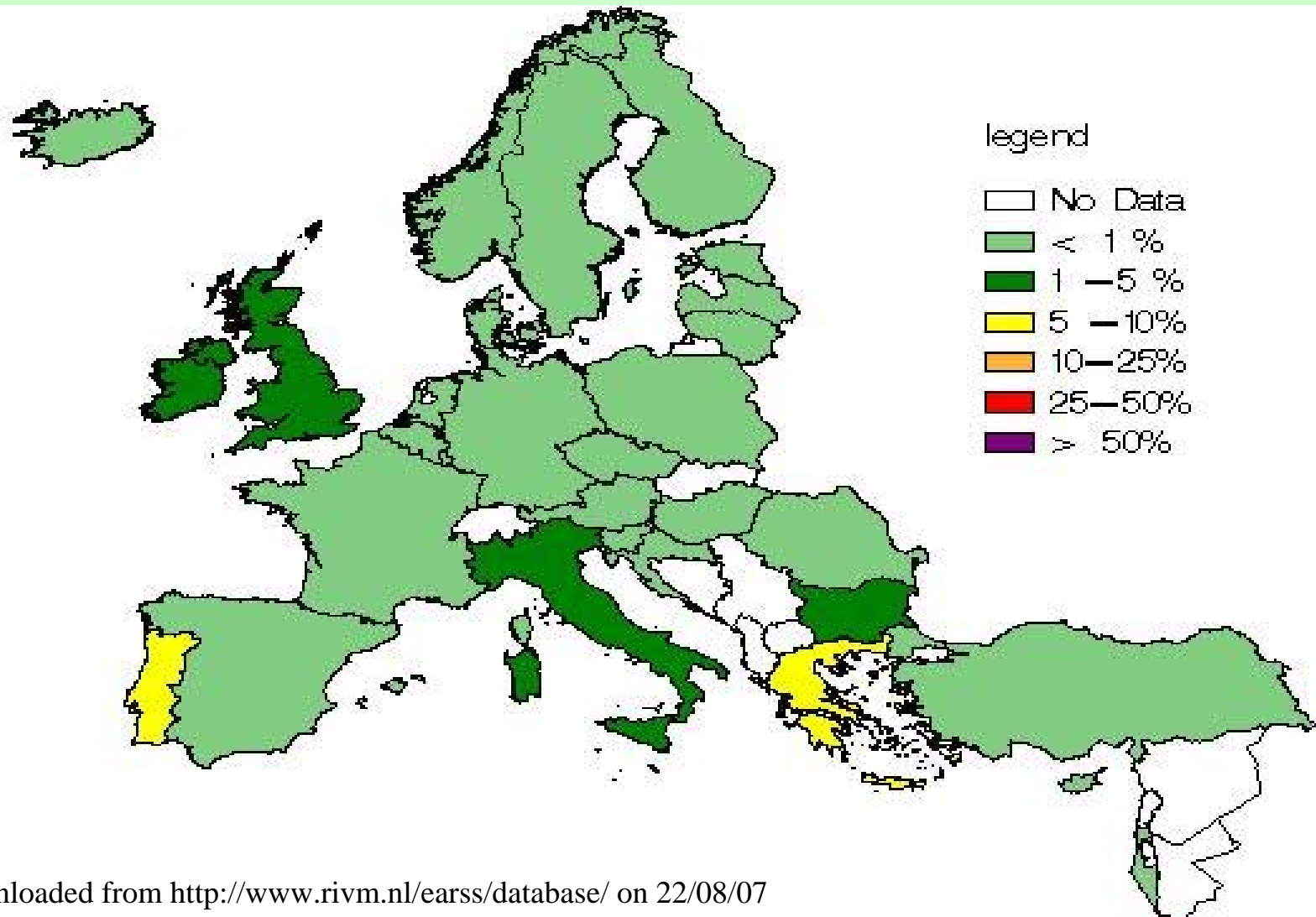
E. faecalis - distribution of aminoglycoside high-level resistance in EARSS countries in 2006



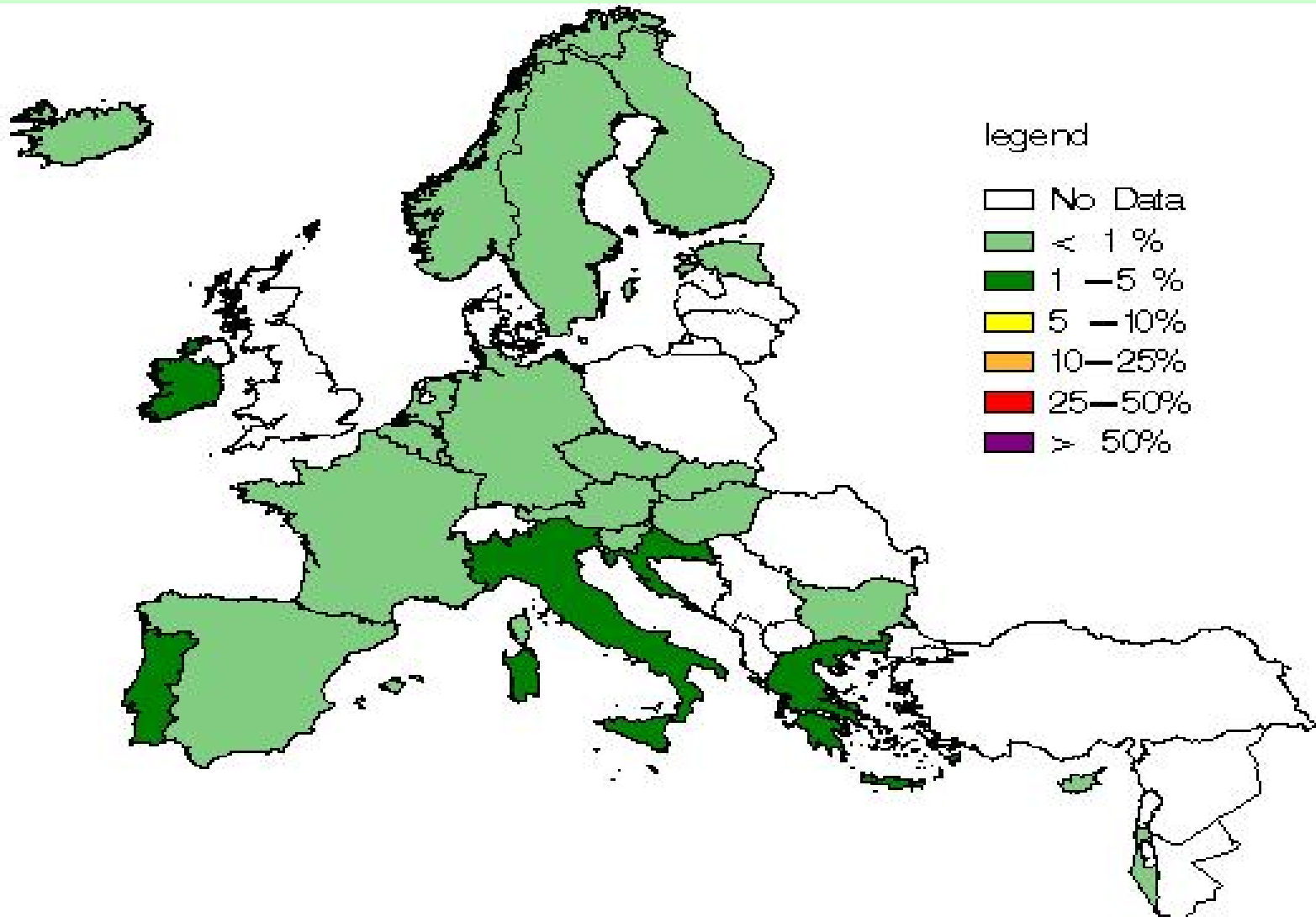
E. faecalis - distribution of aminoglycoside high-level resistance in EARSS countries in 2005



E. faecalis - distribution of glycopeptide resistance in EARSS countries in 2006



E. faecalis - distribution of glycopeptide resistance in EARSS countries in 2005



E. faecium

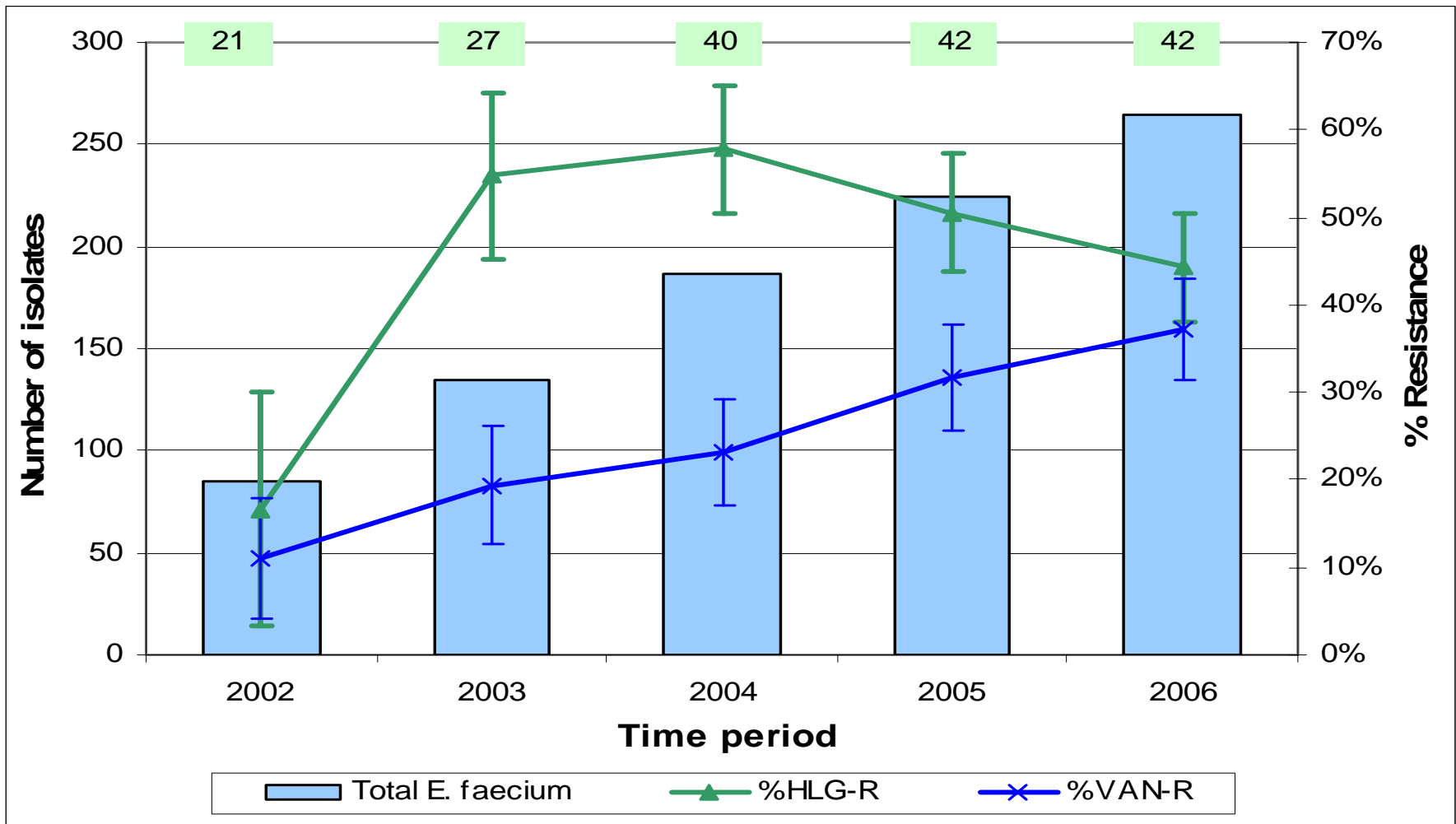
Annual proportions of AMR *E. faecium* bacteraemia, 2002-2006, with 95% Confidence Intervals (CI)

| Year | No. labs | No. isolates | %AMP-R* | 95%CI | %HLG-R* | 95%CI | %VAN-R* | 95%CI |
|------|----------|-----------------|---------|------------|---------|------------|---------|------------|
| 2002 | 21 | 85 | 88.9% | 82.0-95.7% | 16.7% | 3.3-30.0% | 11.1% | 4.3-18.0% |
| 2003 | 27 | 135 | 91.0% | 86.1-95.8% | 54.7% | 45.2-64.2% | 19.4% | 12.7-26.1% |
| 2004 | 40 | 187 | 95.7% | 92.7-98.6% | 57.8% | 50.4-65.2% | 23.2% | 17.2-29.3% |
| 2005 | 42 | 224 | 92.8% | 89.4-96.2% | 50.5% | 43.7-57.3% | 31.7% | 25.6-37.8% |
| 2006 | 42 | 265 | 93.9% | 91.0-96.8% | 44.3% | 38.1-50.5% | 37.1% | 31.3-42.9% |

HLGR, high-level gentamicin resistant

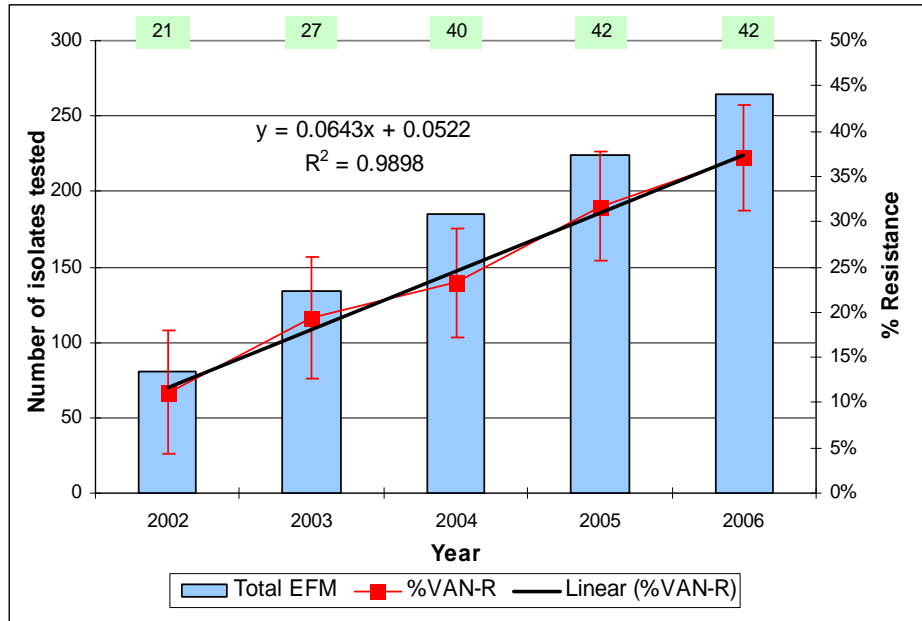
* Not all isolates tested

EARSS in Ireland: *E. faecium* bacteraemia trends, 2002-2006



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

VAN-resistant *E. faecium* (VREfm) trends: Linear regression and Chi² test for trend



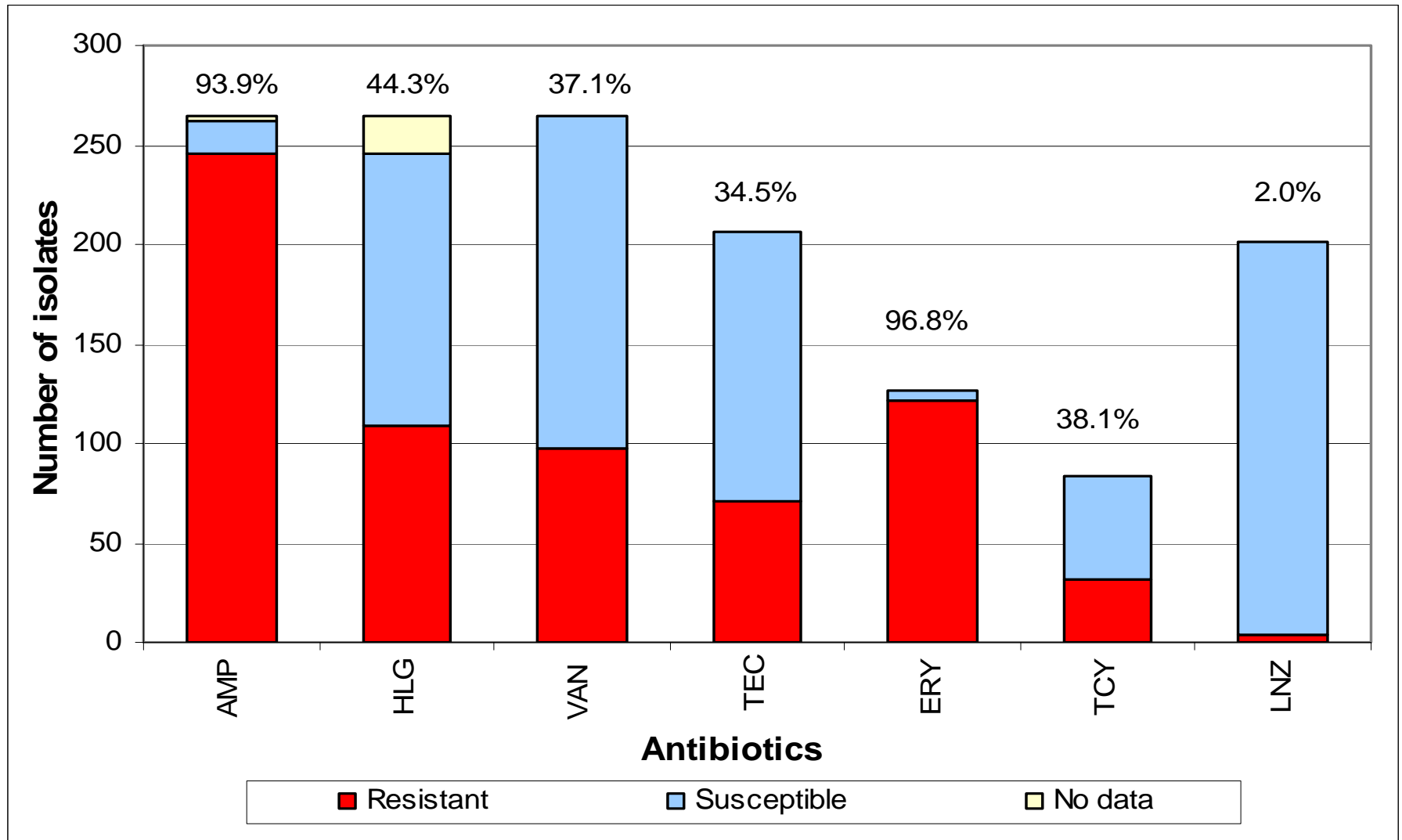
R^2 indicates that the regression line fits the data well suggesting a linear relationship

The proportion of *E. faecium* isolates with resistance to VAN increased significantly ($\text{Chi}^2_{\text{trend}}=30.00$; $P<0.001$) over the five years for which surveillance has been undertaken

Comparison of 2006 data with 2005

- The decrease in HLG-R among *E. faecium* isolates observed from 2005 to 2006 was not statistically significant ($\text{Chi}^2=1.72$, $P=0.19$)
- The increase in VAN-R observed from 2005 to 2006 was also not significant ($\text{Chi}^2=1.58$, $P=0.21$)
- These results were confirmed by the overlapping 95% confidence intervals

Susceptibility data for *E. faecium* bacteraemia isolates in Ireland in 2006



Percentage resistance is indicated above the bar

Resistance profiles *E. faecium* isolates in 2006

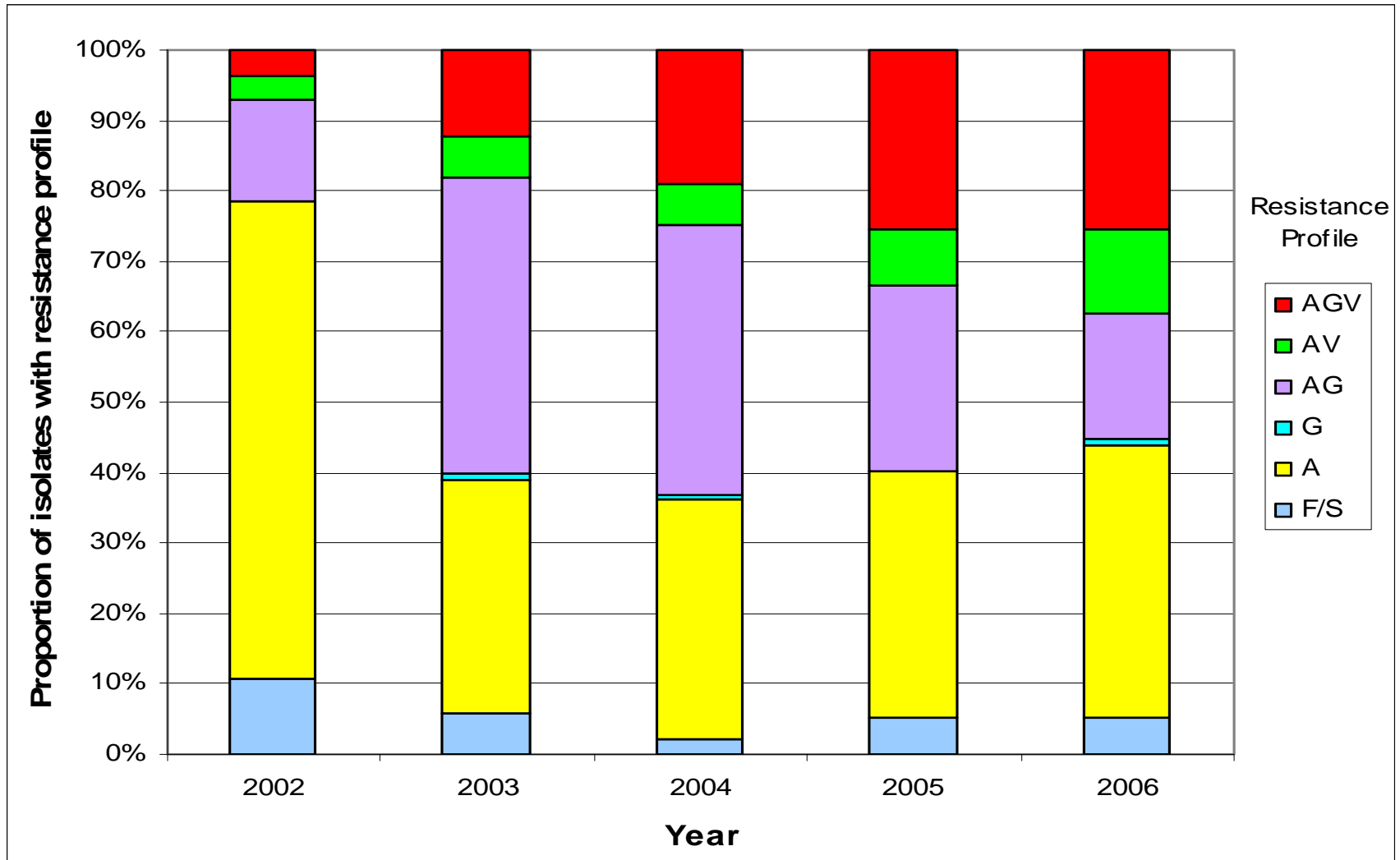
(n = 265)

| Resistance Profile | No. isolates |
|------------------------|--------------|
| Fully susceptible | 13 |
| A | 95 |
| G | 2 |
| AG | 44 |
| AV | 28 |
| AGV | 64 |
| Not tested against all | 19 |
| Total | 265 |

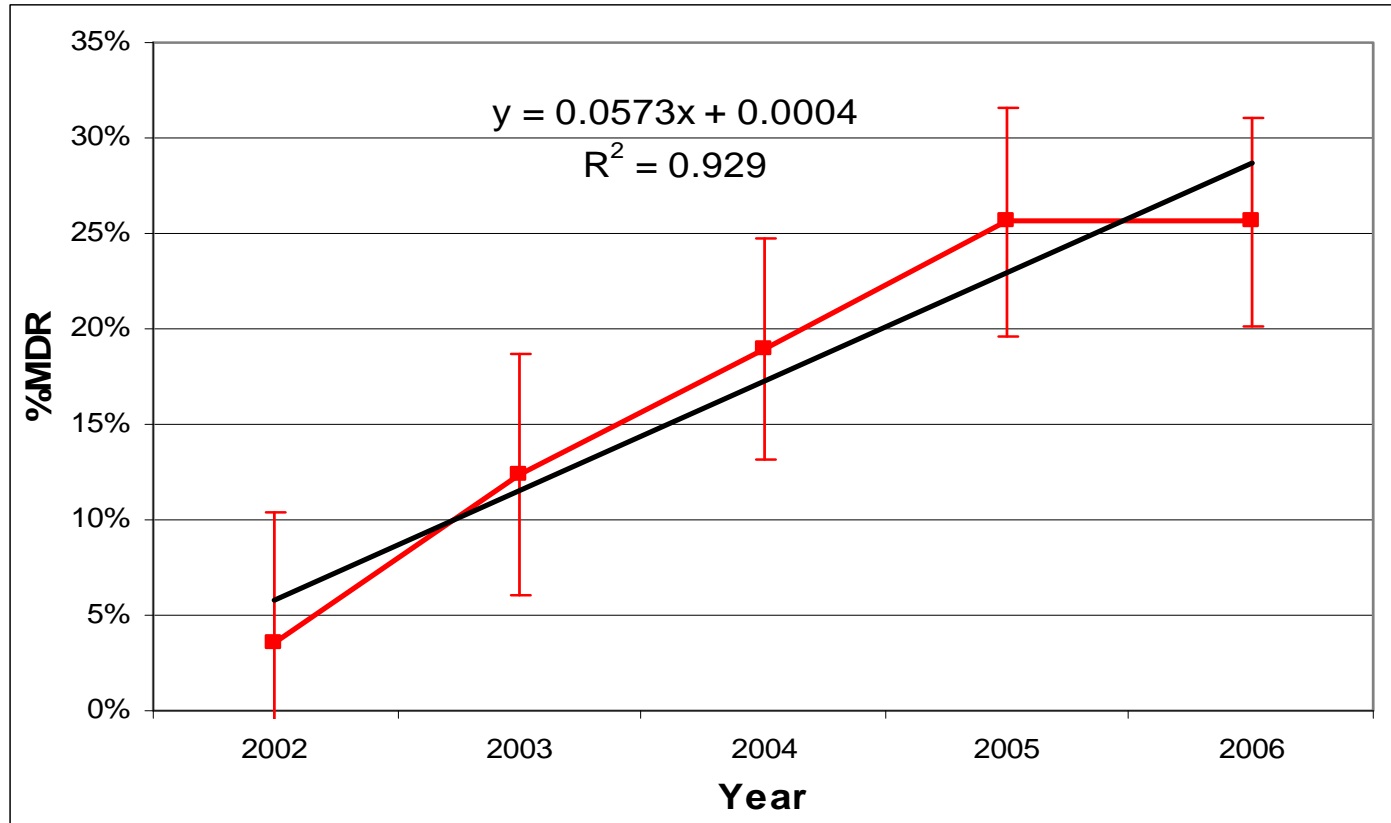
A, Ampicillin; G, High-Level Gentamicin; V, Vancomycin

^ Multi-drug resistant (defined as resistance to all 3 classes)

Changes in resistance profile types of *E. faecium* isolates, 2002-2006



Trends in MDR *E. faecium* isolates, 2002-2006: Linear regression



R^2 indicates that the regression line fits the data well suggesting a strong linear relationship; On average, the %MDR *E. faecium* isolates increased by approximately 6% for each successive year, however, there was no increase between 2005 and 2006

Trends in MDR *E. faecium* isolates, 2002-2006: Figures and Chi² test for trend

| Year | Total <i>E. faecium</i> | Total No. tested for all 3 mandatory antibiotic groups | No. MDR | No. non-MDR | %MDR | L95%CI | U95%CI |
|------|----------------------------|---|------------|----------------|-------|--------|--------|
| 2002 | 85 | 28 | 1 | 27 | 3.6% | -3.3% | 10.4% |
| 2003 | 135 | 105 | 13 | 92 | 12.4% | 6.1% | 18.7% |
| 2004 | 187 | 174 | 33 | 141 | 19.0% | 13.1% | 24.8% |
| 2005 | 224 | 207 | 53 | 154 | 25.6% | 19.7% | 31.5% |
| 2006 | 265 | 246 | 63 | 154 | 25.6% | 20.2% | 31.1% |

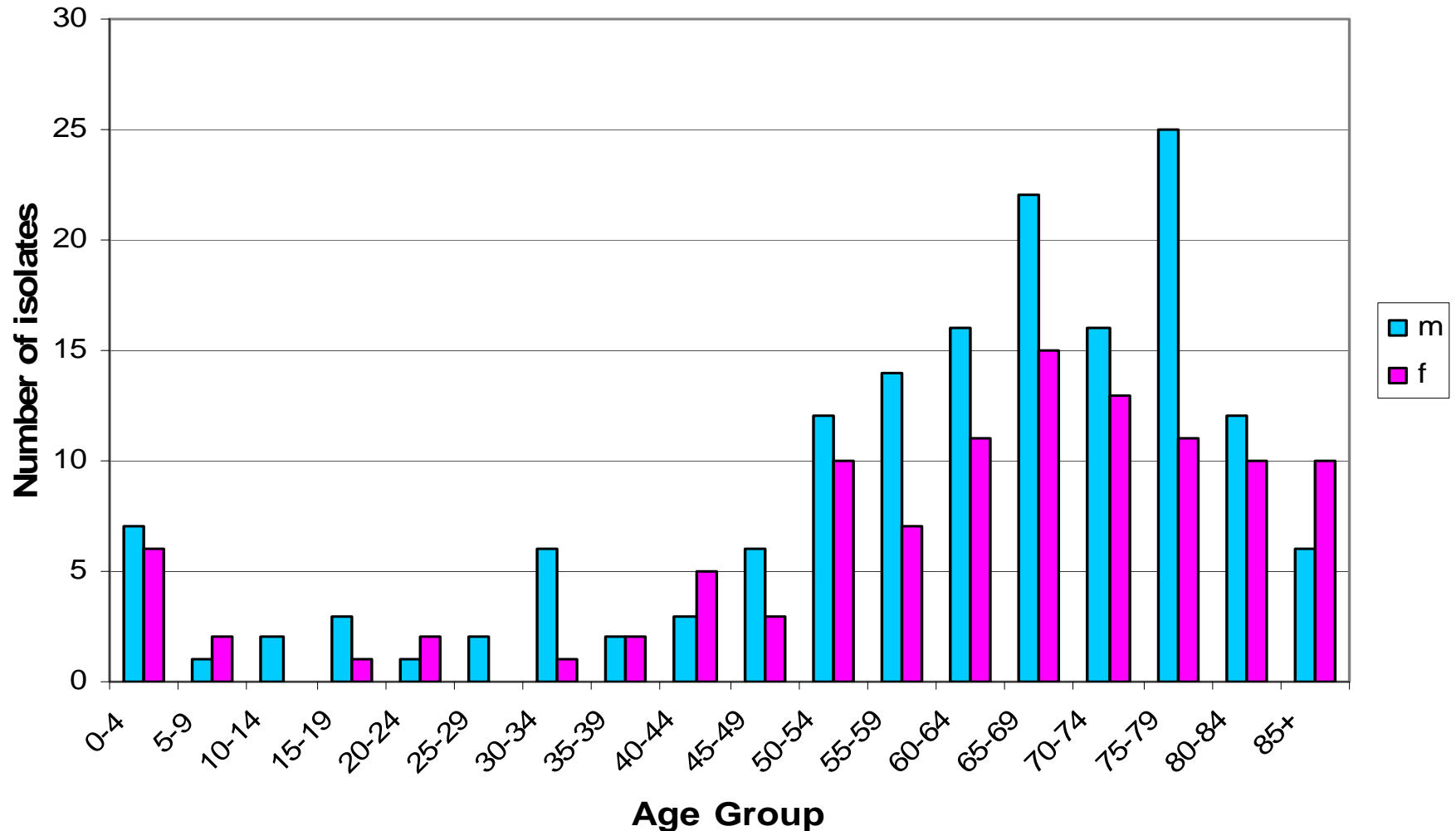
MDR, multi-drug resistant – defined as resistance to all 3 of the mandatory antibiotic groups

* Ampicillin, high-level gentamicin and vancomycin

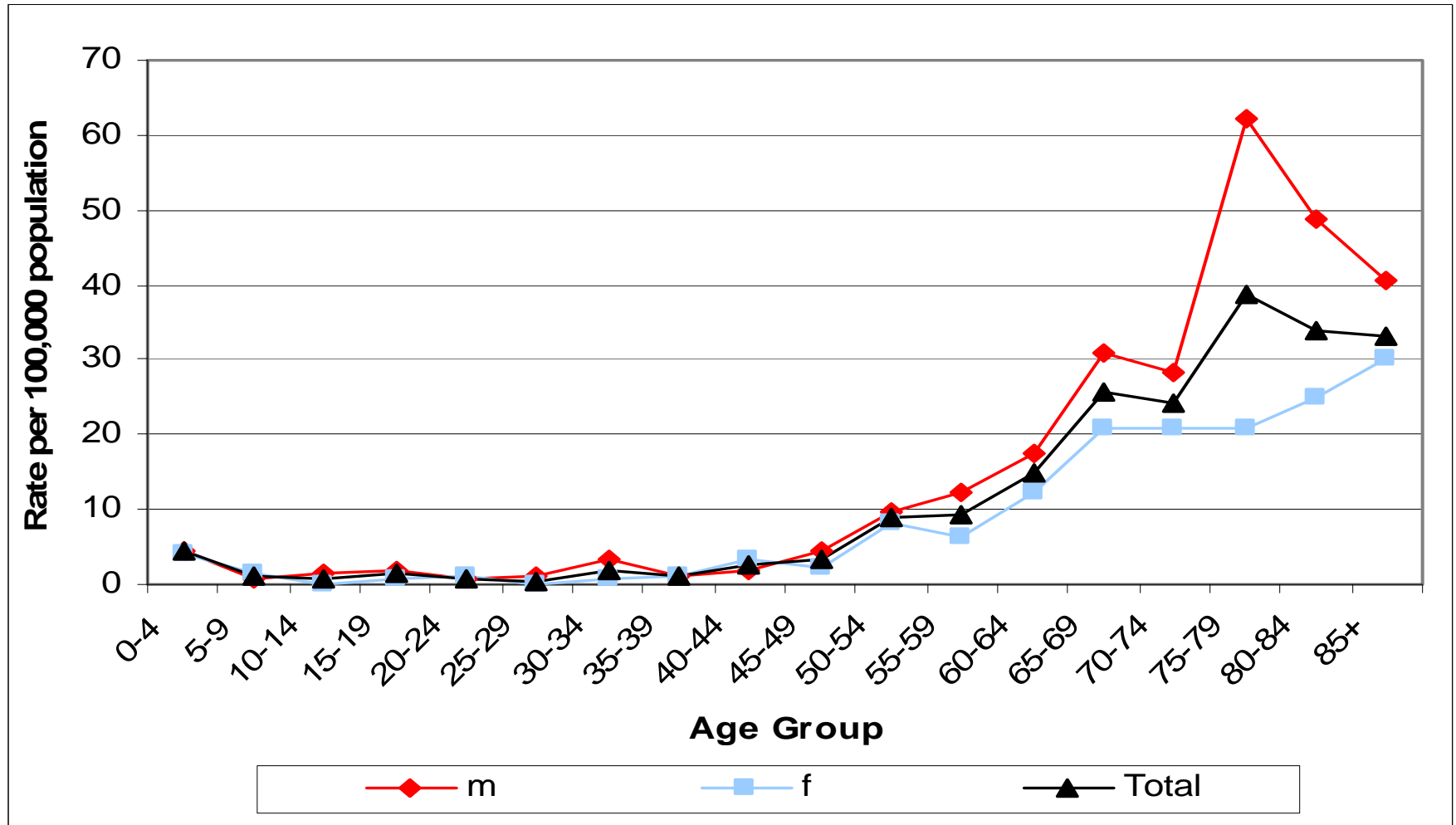
The proportion of MDR *E. faecium* increased significantly
(Chi²_{trend}=12.80; P<0.001) over the first four years

However, the increase observed from 2004 to 2005 was not statistically significant (Chi²=2.38, P=0.12), while from 2005 to 2006 the proportion of MDR isolates remained the same

Age and sex distribution of patients with *E. faecium* bacteraemia in Ireland in 2006



Age and sex-specific incidence rates of *E. faecium* bacteraemia in Ireland in 2006



Using the 2006 census as the denominator

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

Mean, median, mode and range of ages of patients with *E. faecium* bacteraemia in Ireland in 2006

| | No. | No. with age | mean | median (95%CI) | mode | range |
|-------------------|-----|--------------|------|----------------|----------|-----------|
| VRE | 98 | 98 | 62y | 65y (62-69y) | 55y | 12y - 99y |
| VSE | 166 | 166 | 60y | 67y (64-70y) | 0/66/74y | 0d - 89y |
| <i>E. faecium</i> | 265 | 265 | 61y | 66y (64-69y) | 69y | 0d - 99y |

VRE, Vancomycin-Resistant *E. faecium*; VSE, Vancomycin-Susceptible *E. faecium*

The difference in median ages for patients with VRE and VSE bacteraemia is not significant as the confidence intervals overlap

Sex distribution of patients with *E. faecium* (VRE and VSE) bacteraemia in Ireland in 2006

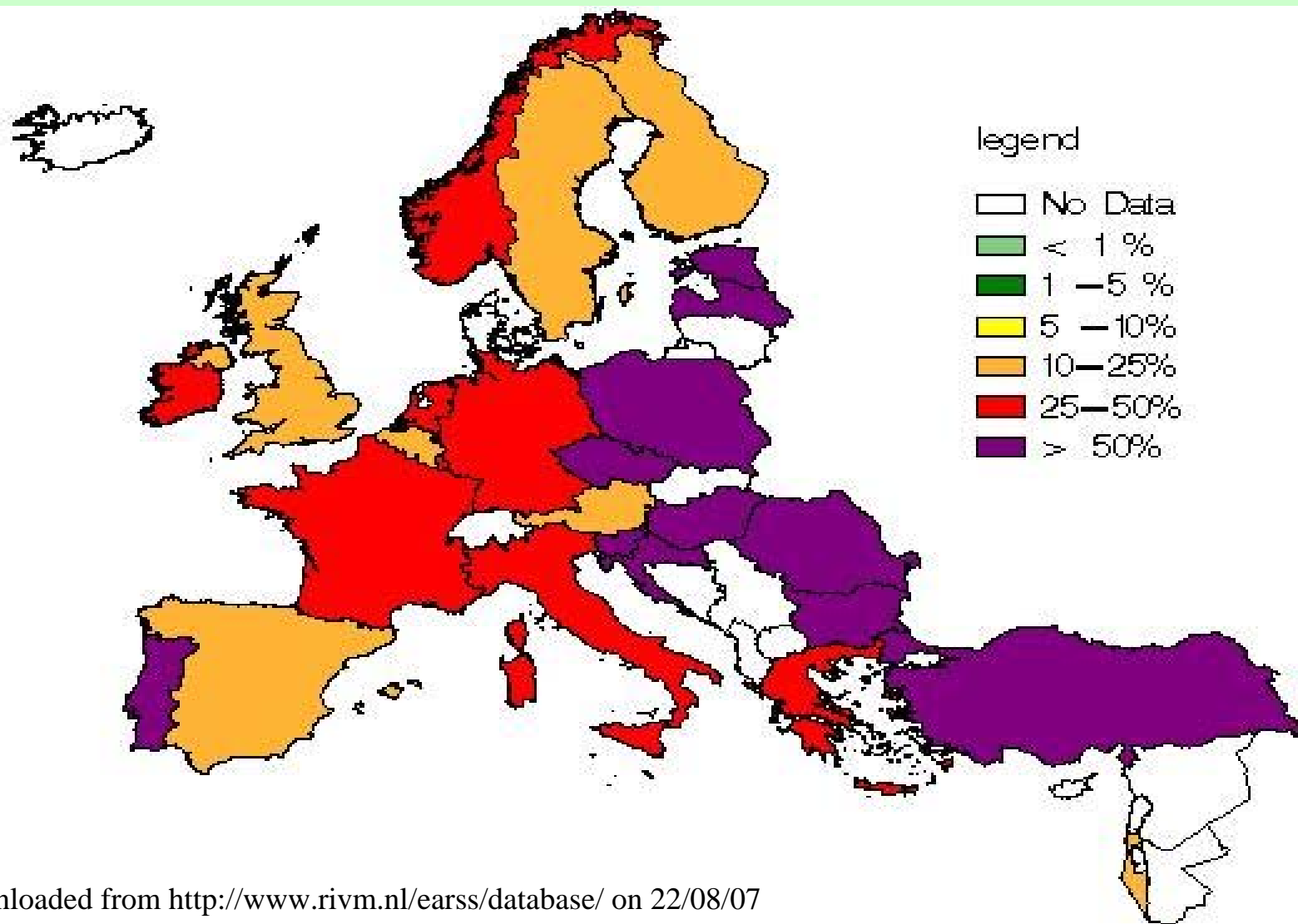
| | No. male | %male | No. female | %female | m/f ratio | z-test | P-value |
|-------------------|-------------|-------|---------------|---------|-----------|--------|---------|
| VRE | 67 | 68.4% | 31 | 31.6% | 2.16:1 | 3.91 | <0.001 |
| VSE | 89 | 53.6% | 77 | 46.4% | 1.16:1 | 0.934 | 0.93 |
| <i>E. faecium</i> | 156 | 58.9% | 109* | 41.1% | 1.43:1 | 2.934 | 0.003 |

* Isolate from one patient not tested against vancomycin

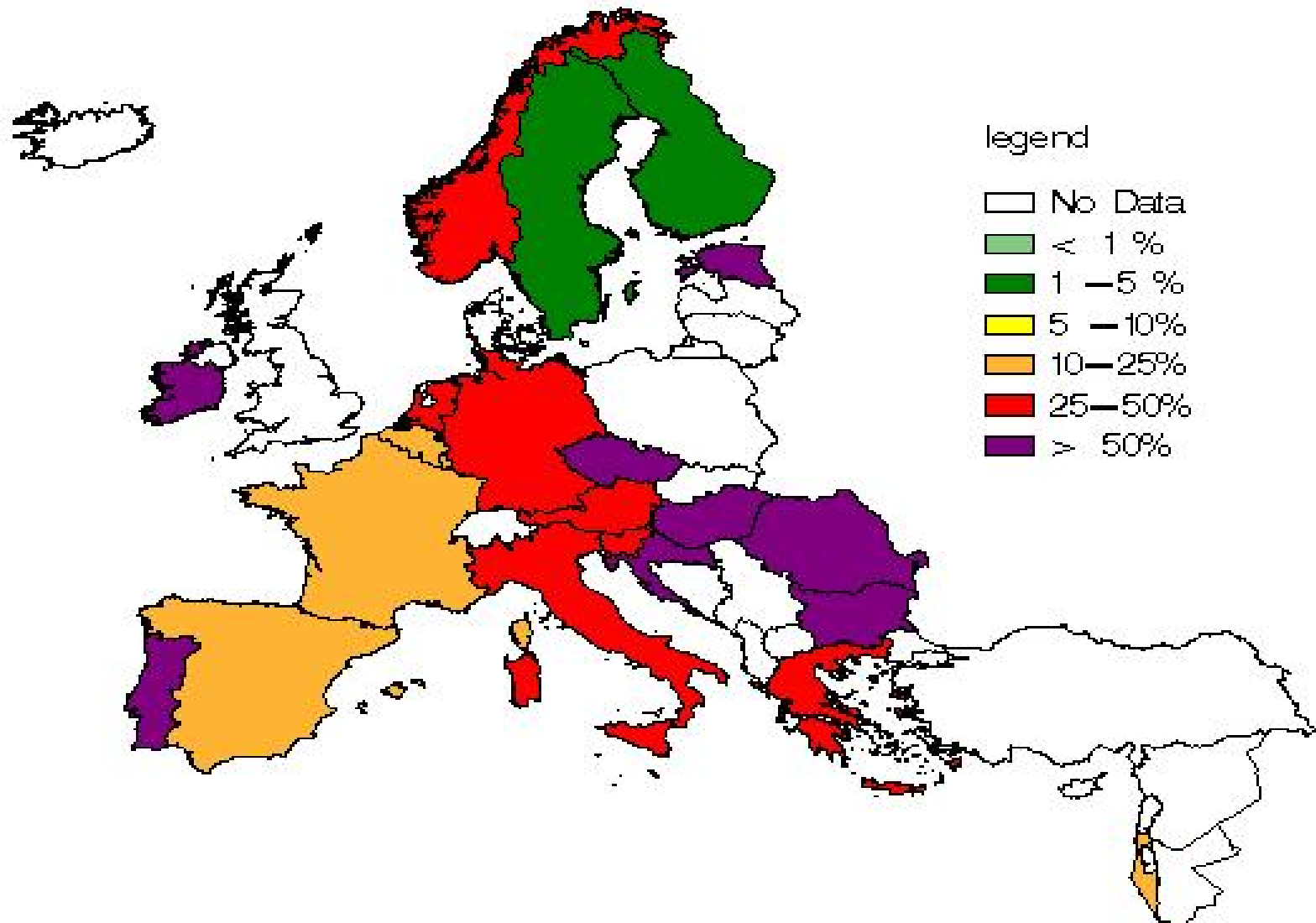
In patients with laboratory-confirmed *E. faecium* bacteraemia in Ireland in 2006, males were approximately 2.2-times more likely to get a VRE infection than females, which was significant ($P<0.001$)

In addition, males were approximately 1.2-times more likely to get a VSE infection than females, but this was not significant ($P=0.93$)

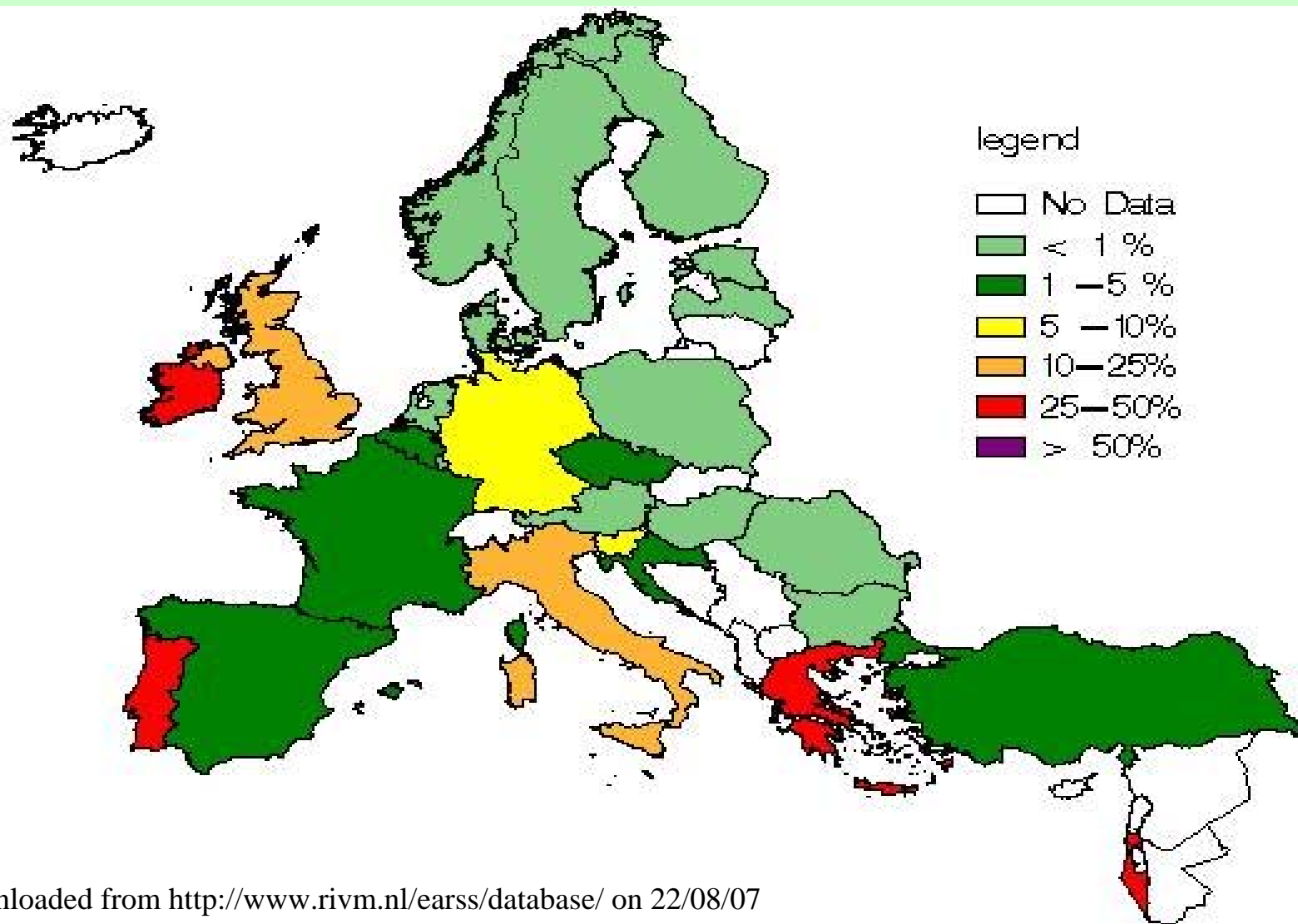
E. faecium - distribution of aminoglycoside high-level resistance in EARSS countries in 2006



***E. faecium* - distribution of aminoglycoside high-level resistance in EARSS countries in 2005**



E. faecium - distribution of glycopeptide resistance in EARSS countries in 2006



E. faecium - distribution of glycopeptide resistance in EARSS countries in 2005

