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Predictive models of antibiotic susceptibility among uropathogens cultured in European Emergency Departments

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INTRODUCTION

According to international guidelines: **empirical treatment of pyelonephritis** with ciprofloxacin **should be restricted to areas where the prevalence of resistance of community uropathogens to** 3rd-generation cephalosporins (3GCs) **is not known to exceed 10%**,

i.e. when the predicted probability of susceptibility to 3GC is ≥90%.

In Emergency Departments (EDs) where prevalence of susceptibility to 3rd-generation cephalosporins (3GCs) is <90%,

identifying urinary isolates with a ≥90% predicted probability of susceptibility to 3GCs may guide the empirical treatment of pyelonephritis.

OBJECTIVE

To identify urinary isolates with 90% predicted probability of susceptibility to 3GCs from data available in the Emergency Departments (ED)
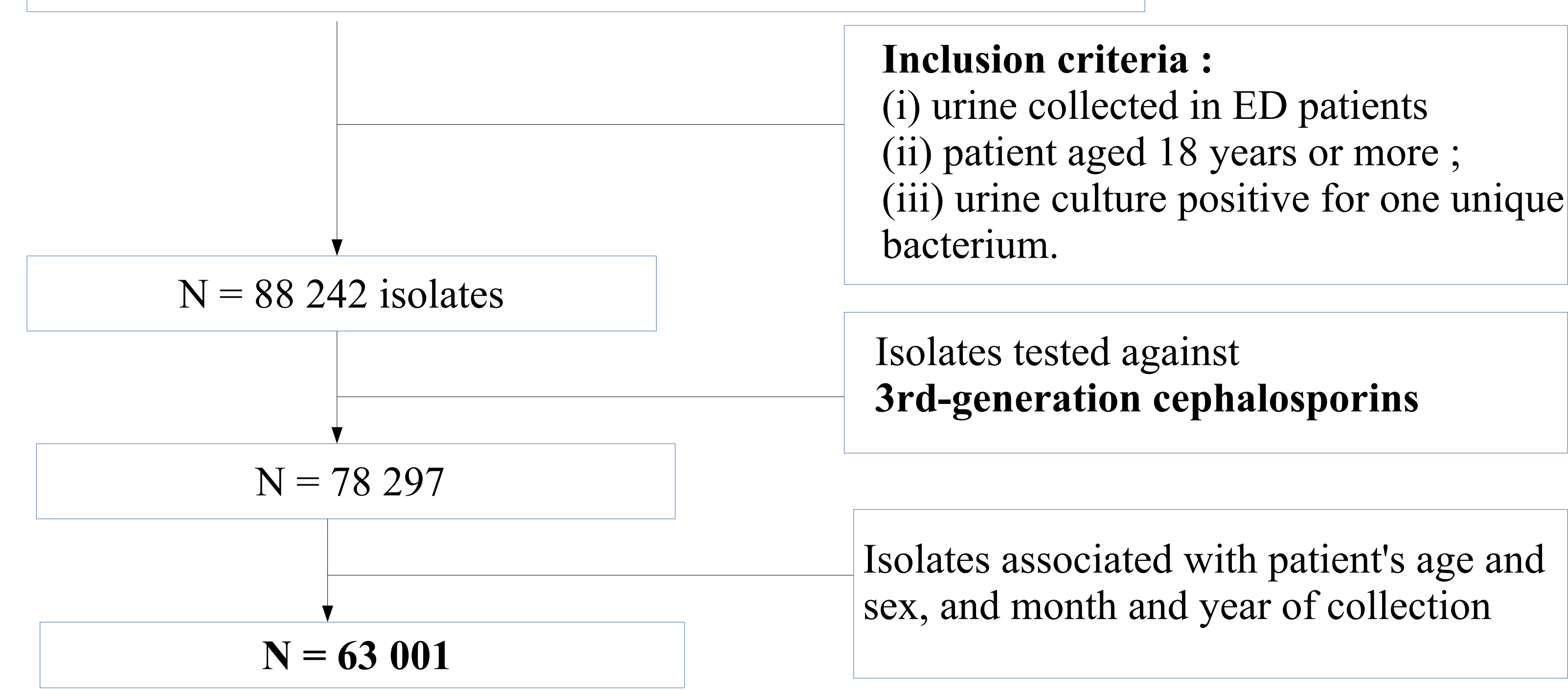
The Euro UTI Group

• **7 European countries**

• **24 Emergency departments**

DATA COLLECTION

All patients having a positive urine culture and visiting one of the 24 Emergency Departments **between January, 1st, 2010 and December,31st, 2016**

Inclusion criteria :
(i) urine collected in ED patients
(ii) patient aged 18 years or more ;
(iii) urine culture positive for one unique bacterium.

N = 88 242 isolates

Isolates tested against **3rd-generation cephalosporins**

N = 78 297

Isolates associated with patient's age and sex, and month and year of collection

N = 63 001

Isolates were classified as non susceptible to 3GCs if they were intermediate or resistant to ceftriaxone, cefotaxime and/or ceftazidime.

STATISTICAL ANALYSIS

To predict the probability of susceptibility to 3GCs :
• Multivariate logistic regression
• Based **only on explanatory variables that are available in ED** : patient's age and sex, ED, month and year of collection.
• **Construction** of the model : data from 2010 to 2015 (N = 51 106)
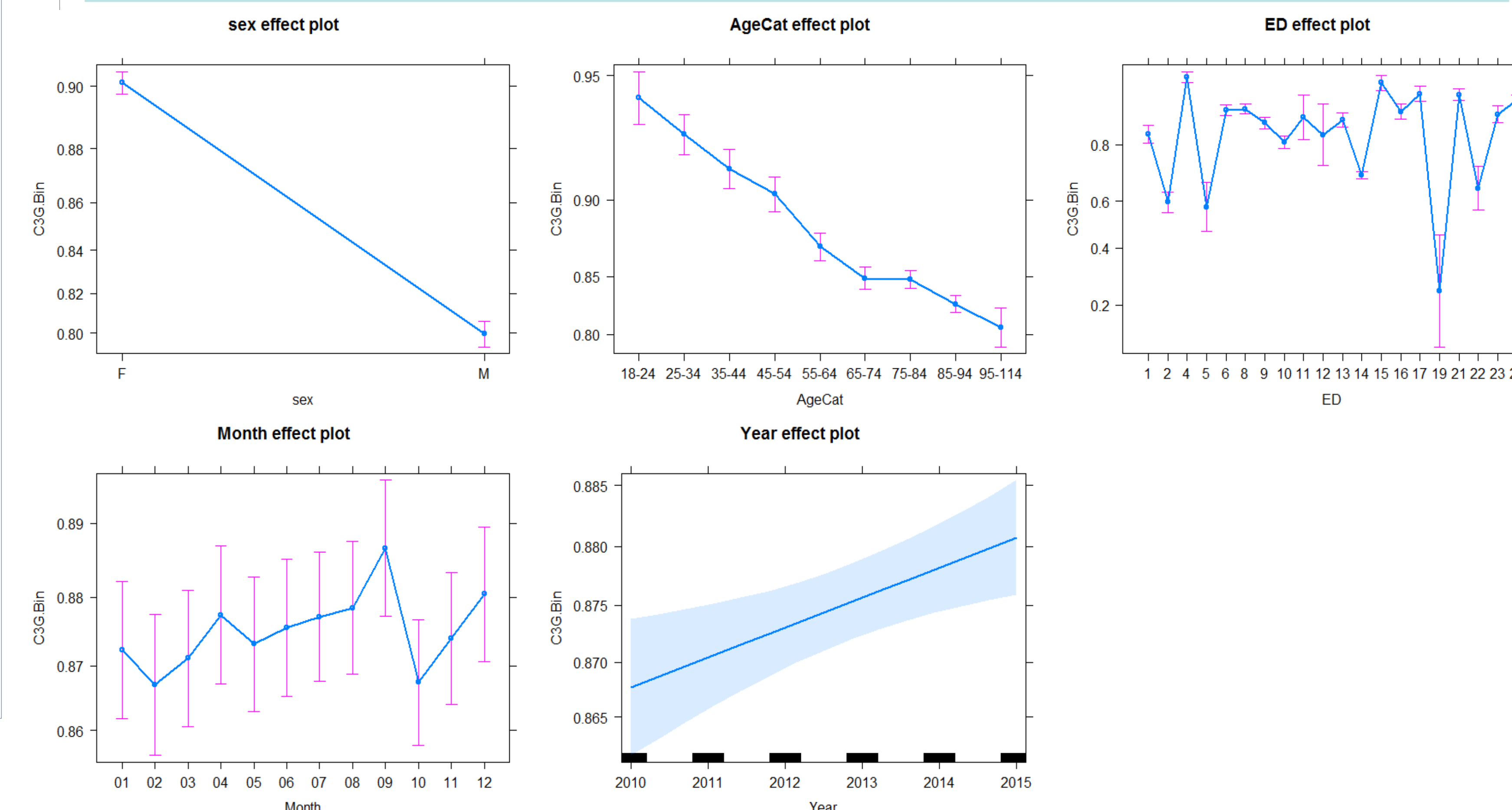
STATISTICAL ANALYSIS

• **Validation of the model** : data from 2016 (N = 11 892)

Assessment done with a calibration belt

Good calibration of the model

• **Test of prediction of the model**
All isolates with the lower bound of the 95% confidence interval of their prediction ≥ **90%**.

4 125 isolates (35 %) were predicted as high probability of susceptibility whereas 3 884 were actually susceptible in the validation set (2016 data).

=> **Positive Predicted Values = 94 %**

More results and on-line calculator of the probability of susceptibility to fluoroquinolones or 3GCs on

https://themiharlab.shinyapps.io/Euro_UTI

DISCUSSION

Model to be updated every year

Efficacy and security to guide antimicrobial treatment of pyelonephritis to be assessed.

CONCLUSION
From patient's age and sex, month of collection and ED, we identified isolates with a high (≥90%) predicted probability of susceptibility to fluoroquinolones or to 3GCs.

A continuous surveillance of antimicrobial susceptibility of EDs urinary isolates is needed, and may be useful to guide the empirical treatment of urinary tract infections in the Emergency Department.

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