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# Key findings of the APRES study

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on behalf of the APRES study  
group

# Motivation for APRES

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*Primary care physicians need to know which antibiotic to prescribe, taking effectiveness and resistance into account*

- Overall levels of antimicrobial resistance are increasing in Europe
- Over 90% of antibiotics for human use are prescribed in primary care
- Information about antimicrobial resistance in the community is lacking

# Goal of APRES

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Provide information and recommendations  
on the appropriateness of prescribing  
antibiotics in primary care  
in Europe

# APRES project features

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- Appropriateness of PREscribing antibiotics in primary care to control resistance in Europe
- EU funded study - 2.8 million€
- 4 ½ year project: October 2009-March 2014
- 14 Partners in 9 countries
- 8 national laboratories / 1 central laboratory
- Core partners: NIVEL, Universities of Nottingham, Antwerp, Maastricht

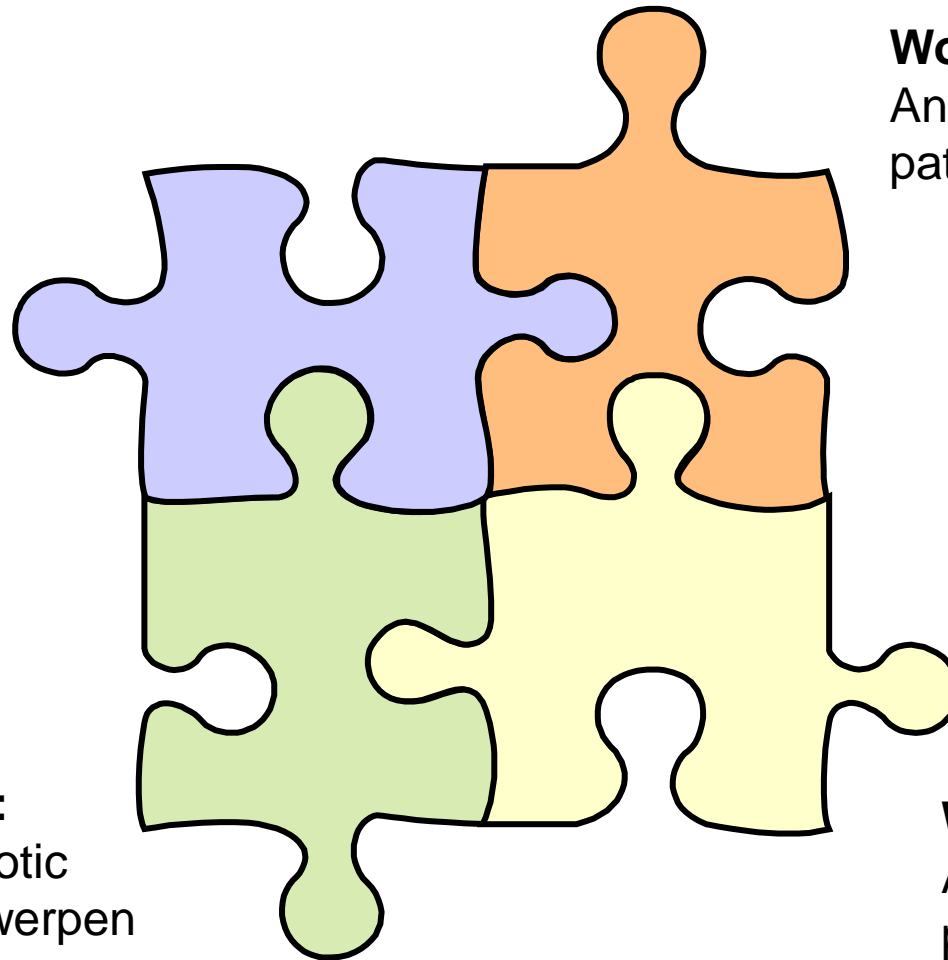


# Collaborative approach

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## Work Package 1:

Literature review;  
Uni Nottingham



## Work Package 2:

Antibiotic resistance  
patterns; Uni Maastricht

## Work Package 3:

Prescribing antibiotic  
patterns; Uni Antwerpen

## Work Package 4:

Appropriateness of  
prescribing antibiotics;  
NIVEL

# Participating countries



# WP 1: Literature review (Uni Nottingham)

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- *Aim: to assess the relationship between the antibiotic resistance pattern of bacteria circulating in the community and the consumption of antibiotics in the community*
- 243/974 studies eligible for inclusion
- Positive relationship was found between antibiotic consumption and resistance
- Meta-analysis generated a pooled odds ratio (effect size) of **2.3 (95% CI 2.2 to 2.5)**
- Countries in southern Europe showed a stronger link between consumption and resistance than other regions

## WP 2: Antibiotic resistance (Uni Maastricht)

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- *Aim: to assess the resistance pattern of S. Aureus and S. Pneumoniae isolated from 36,000 healthy visitors of GP practices in 9 countries*
- Main inclusion criteria:
  - Age: 4 years and older
  - Presenting with a non-infectious disorder
- Nasal swabs from N=32,206 GP practice visitors
- National microbiological labs: isolation of *S. aureus* and *S. Pneumoniae*
- Laboratory Uni Maastricht: antibiotic resistance testing



# WP 2: Antibiotic resistance (Uni Maastricht)

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# WP 2: Antibiotic resistance (Uni Maastricht)

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## Main findings: *S. Aureus* resistance

- High level of penicillin resistance: 65-87%
- Sweden is the champion: for 6 (/ 8) antibiotics lowest resistance rates
- Highest resistance rates:
  - Azithromycin France (17%)
  - Erythromycin France (17%)
  - Clindamycin Belgium (15%)
  - Tetracycline Croatia (7%)
  - Ciprofloxacin UK (5%)

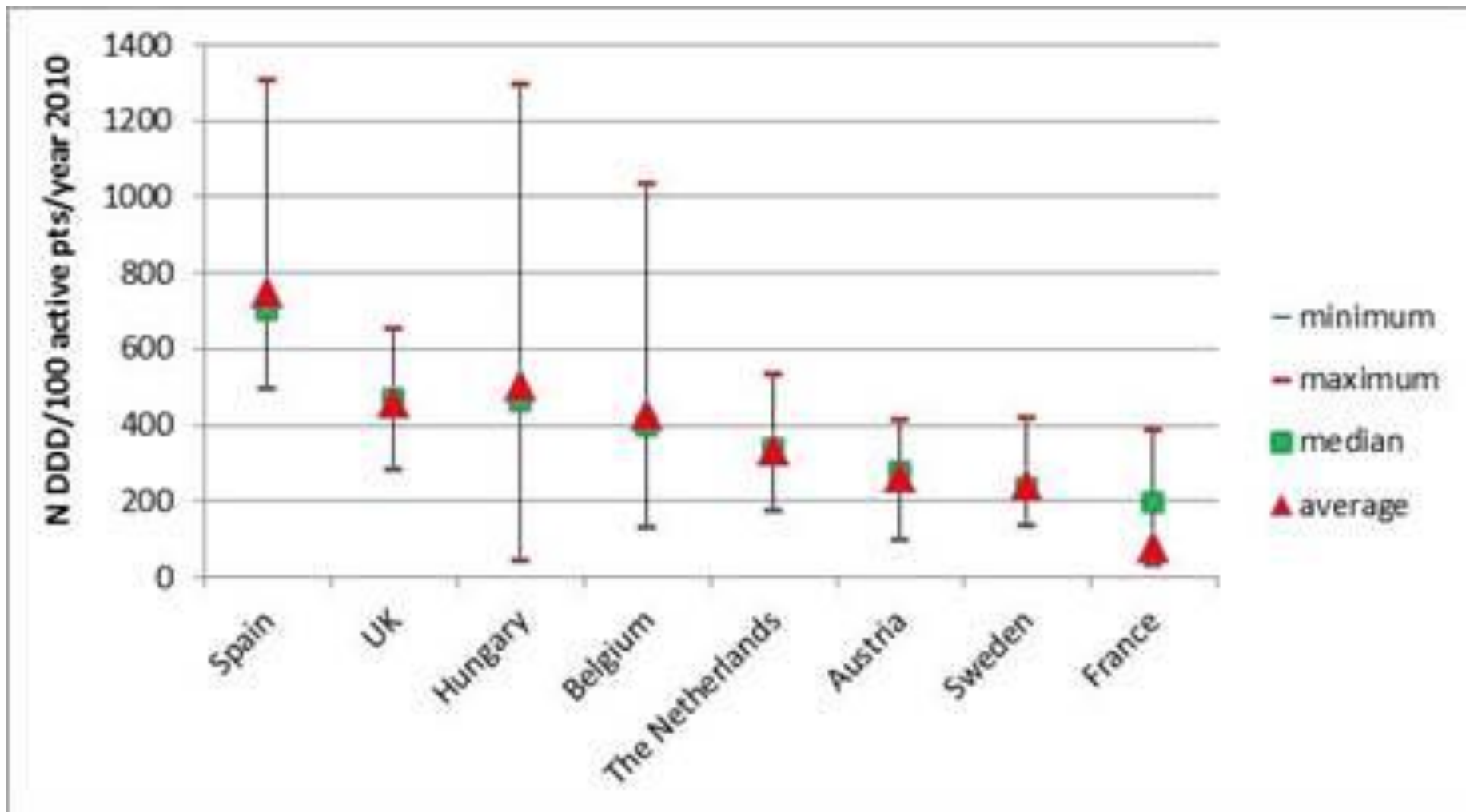
# WP 3: Antibiotic prescribing patterns (Uni Antwerp)

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- *Aim: to assess the antibiotic prescribing patterns of primary care physicians in 9 European countries*
- Electronic prescription data from 187 practices (2010)
- Practice denominator data (total population covered: N=1,2 million people)
- Calculation of Daily Defined Doses (DDDs)

# WP 3: Antibiotic prescribing patterns (Uni Antwerpen)

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# WP 3: Antibiotic prescribing patterns (Uni Antwerp)

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## Main findings

- Highest vs lowest prescription rates: 750 vs 200 DDDs per 100 active patients in 2010
- High within-country variation: Hungary, Spain, Belgium
- Lower prescription rates in France than expected

## WP 4: Appropriateness of treatment guidelines and antibiotic prescriptions (NIVEL)

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*Aim: to assess the appropriateness of primary care treatment guidelines taking into account the antibiotic resistance patterns in 9 European countries*

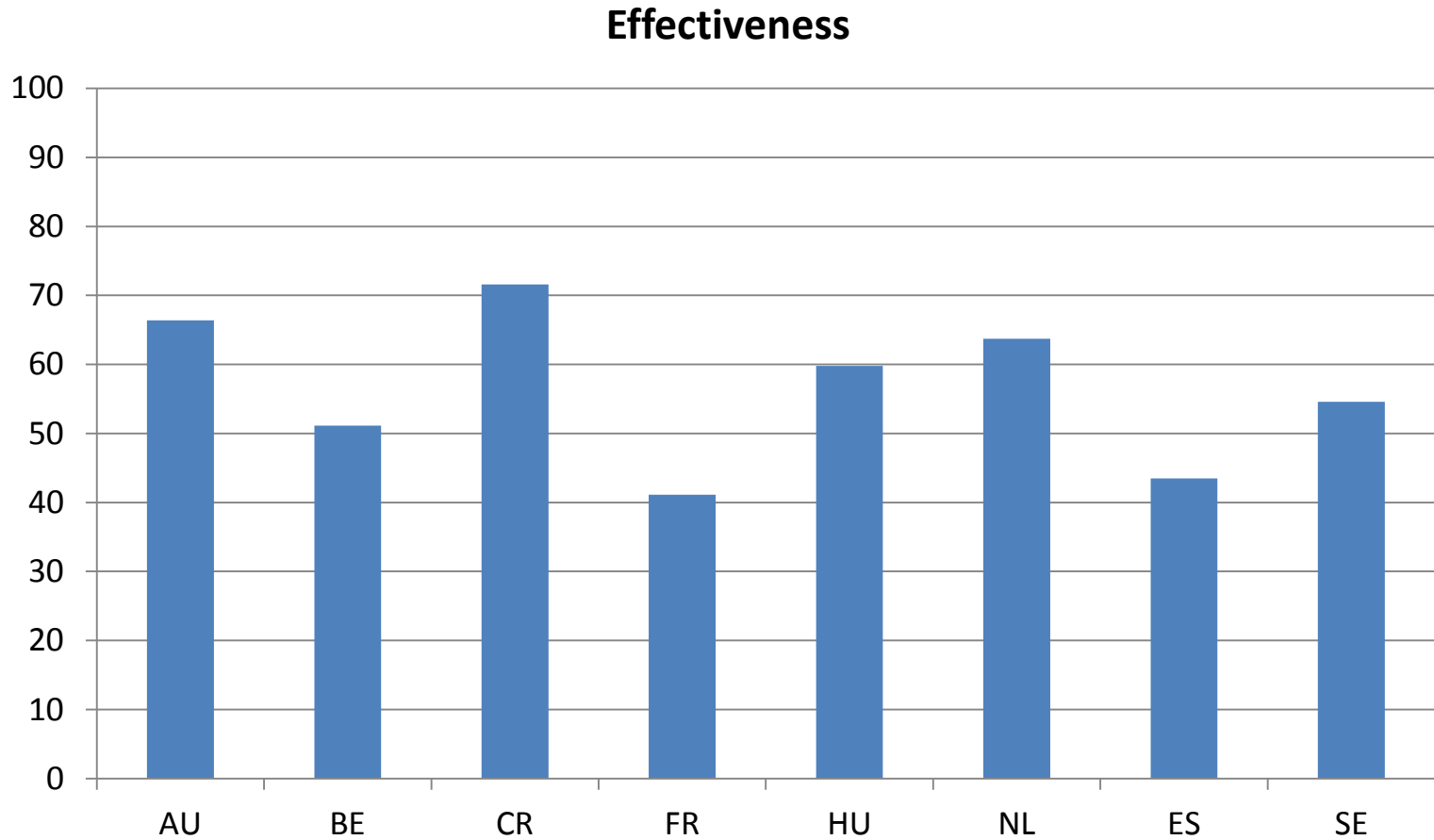
Method: Compare 13 national treatment guidelines for *S. aureus* related skin infections

Conclusions:

- a) Consensus: mainly  $\beta$ -lactam antibiotics
- b) Recommended dosages vary from 5-9 DDDs
- c) Few guidelines based on national resistance data
- d) Treatment guidelines in accordance with resistance patterns

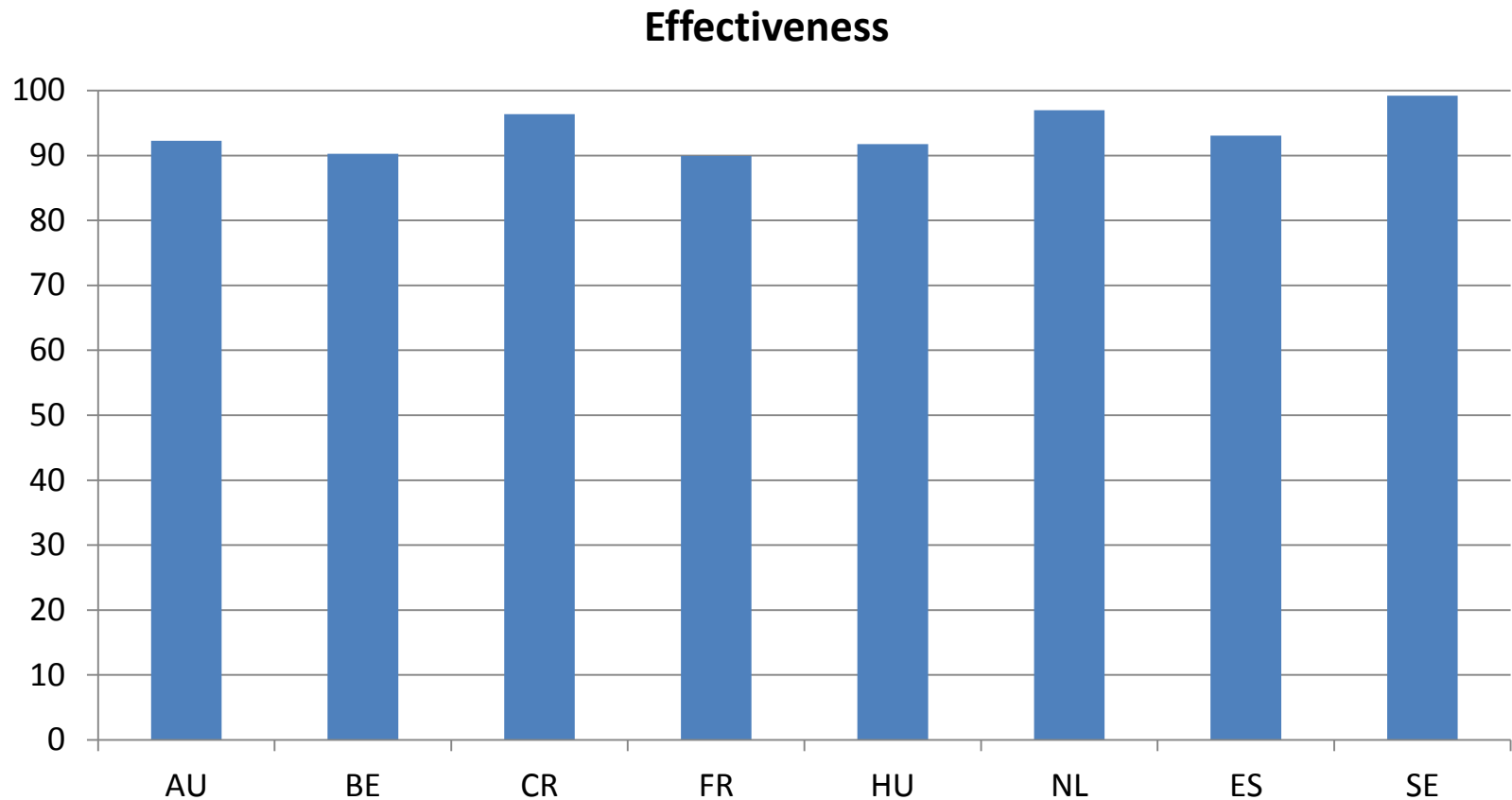
# Theoretical effectiveness of relevant antibiotic treatment of *S. aureus* infections (incl Penicillin)

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# Theoretical effectiveness of relevant antibiotic treatment of *S. aureus* infections (excl Penicillin)

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# Results of APRES

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- Analyses to be finalized:
  - Resistance patterns *S. Pneumoniae*
  - Appropriateness of prescribed antibiotics
- So far, 5 articles in peer reviewed scientific journals, including The Lancet Infectious Diseases
- One PhD graduate and two PhD candidates
- Link with other key scientific projects (e.g. GRACE)
- Link with key public health organisations (national authorities, ECDC, WHO)



# Conclusions

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- Basis for evidence based recommendations for appropriately prescribing antibiotics in primary care in Europe
- Resistance levels for *S. Aureus* in the community are variable across Europe, but generally low (incl. MRSA)
- Antibiotic prescription patterns vary, with the lowest levels in western and northern Europe
- Treatment guidelines for *S. Aureus* skin infections are generally appropriate
- Theoretical effectiveness of antibiotic treatment of *S. aureus* infections: 90-99%



APRES consortium is a good network for European studies in primary care



**Thank you for your attention**